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The user of a teaching machine should consider availability of programed materials, reliability of the machine, and operational ease. The use of teaching machines in the school requires considerations of scheduling, storage, maintenance, replacement, and training for proper utilization. Programed instruction utilization allows teachers more time for individual needs and improves the quality of instruction. A table illustrates several kinds of school utilization of the machine and materials.

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THE TEACHING MACHINE

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1282

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INTRODUCTION

The field of teaching machines has made rapid progress in the past few years. A growing body of evidence has demonstrated clearly the great potential of this scientific approach to learning, to education and training. Correspondingly, a growing number of those responsible for education of all types are carefully examining this young field to determine how to make appropriate use of this efficient approach.

One of the inevitable growing pains of a new technology is the lack of sufficient research to clearly point out proper directions and applications to the potential user. In the case of programmed instruction, the question of how best to use this new approach is, for the most part, awaiting additional research results, reports of further trial and error experiences of the pioneer users, and more and better programs. Inevitable controversies have arisen over determining the best approach and its utilizations. In most cases, these controversies have not been settled. One such controversy surrounds the piece of equipment known most often as the Teaching Machine.

Initially, the teaching machine, per se, was considered to be the important part of programmed learning. It was quickly discovered, however, that it was not the machine that taught, but the program. The field of Teaching Machines became the field of Teaching Machines and Programmed Learning. The machine was then generally acknowledged

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to be a necessary adjunct to the all important program. Soon, however, the programmed text emerged and the question was posed: "Why is a teaching machine needed? Isn't a program in book form sufficient?"

This article is an attempt to clarify and support the role of the teaching machine in programmed instruction. The teaching machine referred to will be in accordance with the following criteria as listed by Finn and Perrin (1962). These criteria are:

1. Used for individual instruction.
2. Contains and presents program content in steps.
3. Provides a means whereby the student may respond to the program.
4. Provides the student with immediate information of some kind concerning his response that can act as a psychological reinforce.
5. Presents the frames of the program individually.
6. Presents the program in a pre-determined sequence.
7. Is cheatproof.

SOME ASPECTS OF TEACHING MACHINES COMPARED TO PROGRAMMED TEXTBOOKS.

Control of Attention

With very little attention, learning is difficult. With no attention, learning is impossible. In most cases, students do not properly attend to the material to be learned and anything that can be done to increase the degree of attentiveness will usually result in greater learning.

A student reading a book, for example, has the entire responsibility for paying attention to specific portions of the book at a given time. Inherently, a book allows the student to pay attention to the irrelevant material. This is as true in the case of a programmed textbook as it is with any other book. In fairness, it must be pointed out that some students can properly assume the responsibility for paying attention to relevant material.

The teaching machine directs the student's attention to the appropriate material with nothing extraneous in view. The student quickly finds it difficult <u>not</u> to pay attention to the teaching machine presentation.

In summary, the teaching machine directs and controls attention to a far greater degree than is possible with a book.

<u>Control of Presentation</u>

When a student uses a programmed book, it is ordinarily expected that he begin at "Once upon a time" and proceed in a straight line to "Happily ever after." It is hoped that he will not peek ahead or jump around. However, there is little guarantee that he will use the book properly. Essentially there exists an uncontrolled situation with the burden of responsibility on the student for proper utilization of the material.

A good program is written in a most carefully sequenced manner so that students learn the material in small, graduated steps.

A good program has been carefully tested, validated and usually revised many times based on students' performance. It follows then that any deviation from the validated sequence would, at best, lead to less efficient learning. The method of controlling the sequencing of material is with the use of a teaching machine. If there is one advantage to a teaching machine that outweighs all other advantages, it is the presentation control aspect.

Cheating

We previsouly referred to students misusing a programmed book by not following the given sequence. This may happen as a result of laziness, curiosity or just plain cheating. Programmed learning is inherently a reinforcing, pleasant way of learning that emphasizes errorless performance and does not encourage cheating. However, with a teaching machine, any possible cheating that may occur, is eliminated. This adds still another control to the learning situation which is not available with a programmed book.

Economic Considerations

For simple economic reasons, a program must be re-usable. Teaching machines allow the student to respond in such a manner as to permit the program to be re-used. Programmed texts often are designed for single use.

One might base his budget thinking for machines on a cost-per-student use. If one were to make maximum use of a teaching machine by utilizing it with different students throughout the school day, the cost of such usage would be literally pennies per student by the end of the first semester.

[illegible]e the programmed text, it is possible for several students to be working on the same program - each on his own machine - at the same time. This can be done as a result of the self-pacing characteristic of programmed instruction where one student has advanced sufficiently ahead of another so that the same program can be used by both students. Naturally, the program must be in a format to allow for separation, such as single sheets of paper or short lessons.

Another point yet to be made for machine use is that the machine will be in use long after a text has worn out through constant handling.

Other

Students generally enjoy working with teaching machines. Instances have been reported of poor learners suddenly becoming anxious to learn with a teaching machine, and in fact, making significant progress. Much of this has been attributed to a so-called "novelty effect." The implication here is that this novelty effect soon wears off. However, ongoing research seems to show that the novelty effect is by no means temporary.

CONCLUSION

As teaching machines become more sophisticated, the controversy with the programmed book will fade and die of natural causes. A teaching machine with audio or with the capacity for teaching a motor skill cannot be substituted by a book. Our present concern is with comparing the less sophisticated teaching machine with the programmed book and it is our contention that to overlook: the control of

attention, the control of presentation, the prevention of cheating and other advantages mentioned for the teaching machine, is to settle for a less effective version of programmed instruction.

WHAT SHOULD THE USER CONSIDER IN A TEACHING MACHINE

The first consideration should be: "Are 'off-the-shelf' programmed materials available to fit the device?" Needless to say the teaching machine does no one good sitting in a store room unused!

A second consideration should be the reliability of the machine. A machine which will require constant repair, maintenance, or highly technical repair, is not the machine to be used for general school use.

It is axiomatic today to use the term "child-proof" for equipment utilized in the school plant. Children are ingenious in discovering methods to cause malfunctioning of equipment. Therefore, another consideration is: "Has the machine been designed for rugged child-use?"

Another judgment factor to be considered is the machine's ease of operation. If it demands operation beyond that of the user's abilities, the result is frustration and an ensuing lack of both, interest and motivation.

UTILIZING THE TEACHING MACHINE IN THE SCHOOL

The use of the teaching machine in the school requires considerations not dissimilar to those of other presently used equipment .. scheduling, storage, maintenance, replacement and training for proper utilization. Table I illustrates several kinds of school utilization of the teaching machine and programmed materials.

TABLE I

PROGRAMMED INSTRUCTION	TEACHER'S ROLE	ACTIVITY LOCATION
1. Large Group Use		
a) On going subject matter instruction	Individual assistance to students needing or desiring help	Instructional Materials Center
b) Review instruction		
c) Supplemental instructional tool		
2. Small Group Use		
a) On going subject matter instruction	Individual assistance	Instructional Materials Center
b) Review instruction		Classroom
c) Supplemental instructional tool		Library
d) Remedial instruction		
e) Gifted children instruction		
3. Individual Use		
a) Remedial	Individual assistance	Classroom
b) Gifted		Library
c) Homework		Study Hall
d) Review		Home
e) Makeup assignment		
f) Home study for lengthy absences		

WHY SHOULD SCHOOLS INITIATE THE USE OF PROGRAMMED INSTRUCTION?

One might ask the same question about the use of films, phonographs, and projectors as well as many other accepted instructional tools. One obvious answer is that it is here, it has gone through extensive experimentation and it works. It offers the teacher more time for individual help and generally improves the quality of human instruction. It is not uncommon to hear statements from tenured teachers who have been exposed to courses in programmed instruction to the effect that if nothing more occured from their experience, they had gained new insights into the organization and presentation of subjectmatter material. As teachers gain experience with the use of programmed instruction, they may benefit by modifying and improving their own instructional techniques.

The teacher should feel at home with programmed instruction and be cognizant of its potentials and limits. Above all, he should be aware of the extent it can help him to achieve the learning objectives he has set forth for his students. There is really only one way he can discover this - by using it.

School registrations are increasing to an extent out of proportion to that of graduating teachers. With increased class sizes, it is impossible for teachers to provide an adequate and sustained level of personal attention to each student. The use of programmed instruction may well give this time. For special purpose - instruction for home-bound students, make-up work for long absence, review for retention,

work with remedial individuals or groups, additional material for gifted students, indeed, for adaption to the learner's individual needs - are reasons enough for immediate action on the part of school administrations to utilize programmed instruction.